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CLAIMS

1. A heart assist device adapted for implantation into a patient, the device including:

- 5 a) an aortic compression means is so shaped and dimensioned that it is adapted, when actuated, to compress the ascending aorta of a patient;
- b) a fluid reservoir; and
- c) an electrically powered pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

10 the fluid reservoir and the pump means are so shaped, dimensioned and interconnected that they are adapted to be wholly positioned within the right chest cavity of the patient.

2. A device as claimed in claim 1, wherein the fluid is a liquid.

3. A device as claimed in claim 2, wherein the liquid is water or saline.

15 4. A device as claimed in any one of the preceding claims, wherein the aortic compression means is curved along its length so as to substantially replicate the curve of the aorta adjacent to the aortic compression means.

5. A device as claimed in any one of the preceding claims, wherein the aortic compression means includes an elastic inflatable cuff adapted to at least partly encircle the aorta.

20 6. A device as claimed in claim 5, wherein the cuff is adapted to completely encircle the aorta.

7. A device as claimed in claim in claim 5 or 6, wherein the cuff is substantially C-shaped and includes two free ends that are adapted to overlap when the cuff is placed around the aorta.

25 8. A device as claimed in claim 7, wherein one of the free ends includes an elongated tongue adapted for suturing in an overlapping relationship to the other end to retain the device adjacent the aorta.

9. A device as claimed in any one of claims 5 to 8, wherein the cuff is a snug fit around the aorta of the patient.

30 10. A device as claimed in any one of the preceding claims, wherein the pump means and the fluid reservoir are provided in a fluid-filled substantially air-tight housing.

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11. A device as claimed in claim 10, further including a pressure compliance means.

12. A device as claimed in claim 11, wherein the pressure compliance means forms part of the housing.

5 13. A device as claimed in claim 12, wherein the pressure compliance means is a substantially rigid portion of the housing downstream of the pump means, the portion being of sufficient rigidity so as to not deform inwardly during aortic compression nor deform outwardly in the absence of aortic compression.

10 14. A device as claimed in claim 12, wherein the pressure compliance means is a substantially flexible portion of the housing downstream of the pump means, the portion being of sufficient flexibility so as to deform inwardly during aortic compression and deform outwardly in the absence of aortic compression

15 15. A device as claimed in claim 14, wherein the flexible portion is adapted to be positioned in juxtaposition with a lung of the patient and deform outwardly to slightly compress the lung in the absence of aortic compression.

16. A device as claimed in any one of claims 5 to 15, wherein the cuff has a single inlet/outlet port.

17. A device as claimed in claim 16, wherein the port has a diffuser therein.

20 18. A device as claimed in claim 16 or 17, wherein the housing has an inlet/outlet port opening in fluid communication with the cuff inlet/outlet port.

19. A heart assist device adapted for implantation into a patient, the device including:

25 a) an aortic compression means which is curved along its length so as to substantially replicate the curve of the aorta adjacent to the aortic compression means and is so shaped and dimensioned that it is adapted, when actuated, to compress the aorta of a patient;

b) a fluid reservoir; and

30 c) pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

the fluid reservoir and the pump means are so shaped, dimensioned and interconnected that they are adapted to be wholly positioned within the chest cavity of the patient.

20. A heart assist device adapted for implantation into a patient, the device including:

a) an aortic compression means which includes an inflatable cuff and is so shaped and dimensioned that it is adapted to encircle and, when actuated, compress the aorta of a patient, the cuff being substantially C-shaped and including two free ends that are adapted to overlap when the cuff is placed around the aorta ;

b) a fluid reservoir; and

c) pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

the fluid reservoir and the pump means are so shaped, dimensioned and interconnected that they are adapted to be wholly positioned within the chest cavity of the patient.

21. A heart assist device adapted for implantation into a patient, the device including:

a) an aortic compression means which includes an inflatable cuff and is so shaped and dimensioned that it is adapted to substantially encircle and, when actuated, compress the aorta of a patient, the cuff having two free ends, one of which includes an elongate tongue adapted for suturing or other connection in an overlapping relationship to the other end to retain the cuff in place around the aorta ;

b) a fluid reservoir; and

c) pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

the fluid reservoir and the pump means are so shaped, dimensioned and interconnected that they are adapted to be wholly positioned within the chest cavity of the patient.

22. A heart assist device adapted for implantation into a patient, the device including:

a) an aortic compression means which, when actuated, compress the aorta of a patient;

b) a fluid reservoir; and

c) pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

the fluid reservoir and the pump means are so shaped, dimensioned and interconnected that they are adapted to be wholly positioned within the chest cavity of the patient and the pump means and the fluid reservoir are provided in a fluid filled substantially air-tight housing.

23. A heart assist device adapted for implantation into a patient, the device including:

- a) an aortic compression means adapted, when actuated, to compress the ascending aorta of a patient;
- b) a liquid reservoir;
- c) a pump means adapted to pump a liquid from the liquid reservoir to the aortic compression means so as to actuate the compression means, the liquid reservoir and the aortic compression means being adapted to be positioned in close juxtaposition with one another within the chest cavity of the patient, and
- d) means to sense the pressure in the liquid in the absence of aortic compression and alter the sensed pressure to a predetermined pressure.

24. A device as claimed in claim 23, wherein the distance between the liquid reservoir and the aortic compression means is no more than 6 cm.

25. A device as claimed in claim 19, 20, 21 or 22, further including a liquid conduit between the liquid reservoir and the aortic compression device which has minimum cross sectional area of at least 1 sq cm.

26. A device as claimed in any one of claims 23 to 25, further including a pressure compliance means.

27. A device as claimed in claim 26, wherein the liquid reservoir, the pump means and the pressure compliance means are provided in an air-tight housing.

28. A device as claimed in claim 27, wherein the housing is fluid-filled and the liquid reservoir is a portion of the interior of the housing.

29. A device as claimed in claim 27 or 28, wherein the pressure compliance means is a flexible portion of the housing adjacent the liquid reservoir.

30. A device as claimed in claim 29, wherein the flexible portion is adapted for positioning in juxtaposition with the lung of the patient.

wherein the cuff is substantially C-shaped and includes two free ends that are adapted to overlap when the cuff is placed around the aorta.

39. An aortic compression means for use in a heart assist device, the aortic compression means including:

5 a) an elastic inflatable cuff adapted to be placed about the ascending aorta of a patient; and

b) a flexible, substantially inelastic, sheath adapted to extend around the cuff and at least assist in retaining it in position on the aorta,

10 wherein the cuff is substantially C-shaped and includes two free ends, one of the free ends includes an elongated tongue adapted for suturing or otherwise connected in an overlapping relationship to the other end to retain the device adjacent the aorta.

40. A device as claimed in claim 37, 38 or 39, wherein the cuff is adapted to at least partially encircle the aorta.

15 41. A device as claimed in claim 40, wherein the cuff is adapted to completely encircle the aorta of the patient.

42. A device as claimed in claim 37 or 39, wherein the cuff is substantially C-shaped and includes two free ends that are adapted to overlap when the cuff is placed around the aorta.

20 43. A device as claimed in claim 37 or 38, wherein one of the free ends includes an elongated tongue adapted for suturing in an overlapping relationship to the other end to retain the device adjacent the aorta.

44. A device as claimed in any one of claims 37 to 43, wherein the cuff is a snug fit around the aorta of the patient.

25 45. A means as claimed in any one of claims 37 to 44, wherein the sheath is a snug fit around the cuff.

46. A device as claimed in any one of claims 37 to 45, wherein the cuff has a single inlet/outlet port.

47. A device as claimed in claim 46, wherein the sheath has an opening complimentary to the cuff inlet/outlet port.

30 48. A device as claimed in claim 37 to 47, wherein the cuff is inflatable to an enlarged pressurised configuration to compressing the aorta and relaxes to a static configuration to relax the aorta.

49. A heart assist device including:

a) an aortic compression means adapted by its shape and dimensions to be placed around the ascending aorta of a patient; and

b) mechanical or electrical actuation means to periodically actuate the aortic compression means in at least partial counterpulsation with the heart,

wherein the aortic compression means and the actuation means are placed wholly within the right chest cavity of the patient.

50. A device as claimed in claim 49, wherein the aortic compression means and the actuation means are adapted to be connected in close juxtaposition within the right chest cavity of a patient.

51. A device as claimed in claim 49 or 50, wherein the aortic compression means is inflatable to compress the aorta and the actuation means includes a pump means adapted to pump fluid into the aortic compression means to inflate same.

52. A device as claimed in claim 51, wherein the actuation means further includes a fluid reservoir and a pressure compensation means.

53. A device as claimed in claim 52, wherein the pump means, fluid reservoir and the pressure compensation means are contained in a fluid-filled air-tight housing.

54. A device as claimed in any one of claims 49 to 53, wherein the pump means is an impeller adapted to drive fluid from the fluid reservoir and the aortic compression means.

55. A device as claimed in any one of claims 51 to 53, wherein the pump means is a fluid-filled sac adapted to be compressed to drive fluid from the sac to the aortic compression means.

56. A device as claimed in any one of claims 51 to 55, wherein the aortic compression means is an inflatable cuff adapted for positioning about the aorta of the patient.

57. A heart assist device adapted for implantation wholly into the chest cavity of a patient, the device including:

a) an aortic compression means adapted, when actuated, to compress an aorta of a patient;

b) a housing with an exterior surface;

c) a fluid reservoir in the housing, the fluid reservoir having a flexible exterior surface forming part of the housing exterior surface; and

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d) a pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

wherein the fluid reservoir flexible exterior surface is adapted to contract during aortic compression and expand in the absence of aortic compression and is further adapted to be positioned substantially adjacent a lung in the patient's chest cavity.

58. A device as claimed in claim 57, wherein the bodily cavity is the thoracic cavity and the organ is the lung.

59. A heart assist device as claimed in any one of claims 1 to 36, or 49 to 58 or an aortic compression device as claimed in any one of claims 37 to 48 when placed in a human or other animal.

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